

Art Unit: 3671

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1. An apparatus for controllably positioning a work implement of an earth moving machine, the work implement including a boom, with attachable rack and dump stops each having a physical boundary, and an attachment being attached thereto, where the boom is actuated by a hydraulic lift cylinder and the attachment is actuated by a hydraulic tilt cylinder, comprising:

implement position sensors that sense the elevational position of the boom and the pivotal position of the attachment and responsively produce respective implement position signals;

a controller that receives the implement position signals, compares the relative position of the boom and the attachment with a pre-determined boundary condition, and produces an electrical valve signal; and

a valve assembly that receives said electrical valve signal and controllably provides hydraulic fluid flow to at least one hydraulic cylinder in response to a magnitude of said electrical valve signal.

2. The apparatus according to claim 1, including at least one look-up table including a plurality of implement position values corresponding to a plurality of scaling values.

3. A method for controllably positioning a work implement of an earth moving machine, the work implement including a boom and an attachment being attached thereto, the work implement including a hydraulic lift cylinder for lifting and lowering the boom and a hydraulic tilt cylinder for dumping and racking the attachment, comprising the steps of:

sensing the positions of the lift and tilt cylinders and producing respective implement position signals;

receiving the implement position signals and producing an electrical valve signal based on a relative position of the boom and the attachment;

comparing the relative positions of the boom and the attachment with a pre-determined boundary position; and

receiving the electrical valve signal and controllably providing hydraulic fluid flow to at least one hydraulic cylinder in response to the relative positions of the boom and attachment in comparison with the pre-determined boundary position.

4. The method of claim 12, including the steps of storing a look-up table that stores a plurality of scaling values that correspond to the position of the lift and the tilt cylinders.

New claims 5-19 added.

5. (new) The apparatus according to claim 2, wherein the controller selects a scaling value from the respective look-up table in response to the respective boom position and attachment position, and responsively produces the electrical valve signal having a magnitude corresponding to the selected scaling factor.

6. (new) The apparatus according to claim 1, wherein the implement position signal corresponding to the elevational position of the boom is indicative of the lift cylinder extension, and the implement position signal corresponding to the pivotal position of the bucket is indicative of the tilt cylinder extension.

7. (new) The apparatus according to claim 1, wherein said attachment comprises a bucket.

8. (new) The apparatus according to claim 1, including an operator controlled joystick that produces an operator command signal for controlling the movement of the work implement.

9. (new) The apparatus according to claim 8, wherein said controller receives the implement position signals and said operator command signal, determines the relative position of the boom and the attachment, and produces an electrical valve signal corresponding to the relative position of the boom and the attachment.

10. (new) The apparatus according to claim 9, including at least one look-up table including a plurality of implement position values corresponding to a plurality of scaling values.

12. (new) The apparatus of claim 1 wherein said pre-determined boundary condition corresponds to the physical boundary of at least one of the rack stops or dump stops.

13. (new) An apparatus for use with a work machine, comprising:  
a work implement including a boom and an attachment;  
an operator controlled joystick that produces an operator command signal for controlling the movement of the work implement;

implement position sensors that sense the elevational position of the boom and the pivotal position of the attachment, and responsively produce respective implement position signals;

a controller that receives the implement position signals and operator command signal, compares the relative position of said boom and said attachment with a pre-determined boundary condition, and produces an electrical valve signal; and

valve assembly that receives said electrical valve signal and controllably provides hydraulic fluid flow to at least one hydraulic cylinder in response to a magnitude of said electrical valve signal.

14. (new) The method of claim 4, including the step of selecting a scaling value based on the relative positions and responsively controlling the movement of at least one of said boom or said attachment.

15. (new) The method of Claim 14, including the step of stopping the movement of at least one of said boom or said attachment when said relative position substantially equals said pre-determined boundary position.

16. (new) The method of claim 14, including the step of reducing the movement of at least one of said boom or said attachment when said relative positions approach said pre-determined boundary position.

17. (new) A method for controllably moving a work implement of an earth moving machine in response to the position of an operator controlled joystick, the work implement including a boom and an attachment being attached thereto, the work implement including a hydraulic lift cylinder for ~~lifting~~ and lowering the boom and a hydraulic tilt cylinder for dumping and racking the attachment, comprising the steps of:

sensing the positions of the lift and tilt cylinders and producing respective implement position signals;

sensing the position of the joystick and producing an operator command signal;

receiving the implement position signals and the operator command signal;

comparing the relative positions of the boom and the attachment with a pre-determined boundary position;

reducing the operator command signal in response to the relative positions of the boom and the attachment with the pre-determined boundary condition, and producing an electrical valve signal based on the reduced operator command signal; and

receiving the electrical valve signal and controllably providing hydraulic fluid flow to the respective hydraulic cylinders in response to the relative positions of the boom and attachment in comparison with the pre-determined boundary position.

18. (new) The method according to claim 17, including the step of selecting a scaling value from a look-up table in response to the respective lift and tilt cylinder positions, multiplying the scaling value by the magnitude of the operator command signal, and responsively producing the electrical valve signal having a magnitude equal to the product of the multiplication.

19. (new) The method of Claim 17, including the step of stopping the movement of at least one of said boom or said attachment when said relative position substantially equals said pre-determined boundary position.